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EXPANDED PERLITE AND METHOD FOR THE FORMATION THEREOF

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This invention relates to the production of expanded perlite. In particular, the invention is concerned with expanded perlite which is adapted to be used in the preparation of lightweight structural panels.

It has been recognized that expanded perlite can be advantageously employed in the production of structural panels and reference is made to applicants' copending application Ser. No. 57,171, filed Sept. 20, 1960, and entitled "Panels of Expanded Perlite and Method and Machine for Same," for a discussion relative to the production of such panels. As noted therein, expanded perlite structures can be produced with the structures being characterized by relatively high strength, low density, good dimensional stability, good appearance, and good acoustical properties.

The production of expanded perlite for use in the formation of structural panels differs considerably from the production of similar panels produced from clay or shale particles. A complete discussion of such differences is set forth in said copending application; however, the basic distinction lies in the fact that the reaction of perlite during expansion in response to heat differs materially from the conditions prevailing in the treatment of clay or shale. Perlite is characterized by the presence of combined water which begins to be released when the perlite is heated to about 1200° F. The combined water and released vapors act as a plasticizer for the perlite particles whereby a plasticity is experienced during continued heating above 1400° F. Agglomeration can be achieved if the particles are rapidly heated to a temperature within the range where vapor release and plasticity occur simultaneously, for example in the temperature range of 1400-2400° F. and preferably between 1600 and 2400° F.

In the perlite reaction, the reasonably rapid elimination of the last of the combined water requires heating to a temperature above 1800° F. and in most cases, between 2200 and 2400° F. This is required since the removal of the combined water prevents fusion or reduction of the perlite to a pyroplastic state at lower temperatures. Accordingly, plasticity for purposes of agglomeration can economically only be achieved by heating to a fusion stage preferably in excess of 2200° F., if combined water has been driven out. Therefore, slow heating of the perlite particles is undesirable since the elimination of the combined water prior to the achieving of a pyroplastic state will substantially decrease the amount of expansion that will occur and will require heating to excessive temperatures to achieve fusion. Even at this second stage of fusion, any expansion which may have previously been achieved will tend to be lost by collapse of the expanded particles, and the heating will also reduce the perlite to a relatively fluid state resulting in the formation of a glassy phase.

The aforementioned copending application achieves the formation of perlite panels having the desired characteristics by controlling the treatment of the perlite within certain limits. Specifically, the disclosure provides a treating operation which provides for the rapid heating of perlite particles to a temperature between 1400 and 2000° F. The rapid heating is accomplished in a few minutes during travel of the perlite through a furnace,

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and the desired expansion and agglomeration will occur when the operation is properly controlled.

In the discussion of the aforementioned copending application, reference is made to the use of a flux in combination with the perlite particles. This flux acts to improve the quality of the completed panels since the flux collects on the surfaces of the perlite particles and functions as a binder to more effectively secure the expanded particles one to another in the final structure. The fluxes employed also react with surface portions of the perlite and result in a lower melting point combination.

It is considered desirable to employ fluxes in procedures of the type described; however, the use of such fluxes has been found to produce certain disadvantages. These problems relate to the fact that perlite expanded with continued heating will gradually fuse to a more or less dense mass with the time necessary for fusion depending upon the temperature and type of perlite ore. When a flux is employed, the time required for sintering is considerably shortened and, therefore, the heating of the perlite must be carefully controlled so that the desired amount of sintering will take place without any additional heating which would lead to fusion and substantial loss in the amount of expansion.

It has also been recognized that the sintered or agglomerated product containing active flux will have less desirable characteristics from the standpoint of temperature resistance. Thus, the presence of the active flux will tend to produce a lower softening point in the final product whereby the panels produced will have a maximum temperature of use less than panels which do not contain such flux.

It is an object of this invention to provide improved perlite panels and improved methods for their manufacture.

It is a more specific object of this invention to provide a system for the production of perlite panels wherein a flux is employed whereby the advantages of the flux can be realized while the disadvantages of the flux can be eliminated.

It is an additional object of this invention to provide techniques for the production of perlite panels which provide for the use of a flux but which do not require particularly precise controls from the standpoint of reaction time.

It is a still further object of this invention to provide perlite panels which contain flux, and which are capable of use at extremely high temperatures.

These and other objects of this invention will appear hereinafter and it will be understood that the specific examples included herein are provided only to illustrate the concepts of this invention and are not to be considered as limiting the scope of the invention.

The instant invention is generally directed to the formation of perlite panels wherein perlite particles are exposed to heat for expansion and wherein sintering of the particles is undertaken to achieve an agglomerated final product ideally suited for use as structural panels. In the processing of this invention, the perlite particles are mixed with a flux whereby the reaction to achieve a pyroplastic state, and to achieve expansion and ultimate fusion for agglomeration, can be efficiently undertaken.

In addition to the use of the perlite and a flux, the technique of this invention also provides for the use of clay in particle form whereby an unusual reaction can be achieved to eliminate the disadvantages previously recognized when fluxes were employed in combination with perlite particles. It has specifically been found that the presence of clay in the combination of perlite and flux will retard or completely stop the fluxing action